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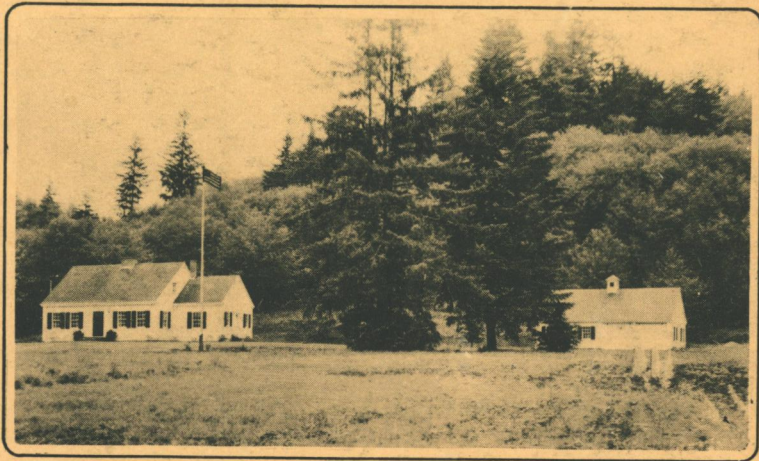
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PACIFIC NORTHWEST FOREST AND RANGE

A GUIDE TO THE
PORTLAND 5, OREGON

CASCADE HEAD EXPERIMENTAL FOREST^o

ON THE OREGON COAST HIGHWAY
NEAR OTIS, OREGON



MAINTAINED BY THE
PACIFIC NORTHWEST FOREST & RANGE EXPERIMENT STATION

IN COOPERATION WITH
SIUSLAU NATIONAL FOREST

FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE
PORTLAND, OREGON

1949



The 95- to 100-year-old even-aged Sitka spruce-Western hemlock forest along the Summit Road; this is the prevailing type on Cascade Head Experimental Forest.

A GUIDE TO THE CASCADE HEAD EXPERIMENTAL FOREST

The Cascade Head Experimental Forest is one of seven areas on the national forests of the Pacific Northwest region set apart for research in forest, watershed, and range management, and for test and demonstration of promising practices. Each of these forest areas is representative of a prevalent and important forest or range type or types. The Cascade Head Experimental Forest exemplifies conditions typical of the humid zone on the west slope of the Coast Range in extreme western Washington and the northern two-thirds of extreme western Oregon, the so-called "fog belt." The area lies quite centrally within this distinctive forest zone, whose principal forest cover is Sitka spruce, Western hemlock, red alder, and Douglas-fir, the last named being far less conspicuous than elsewhere in the "Douglas-fir region."

The area is part of the Siuslaw National Forest and was set aside as an experimental forest by order of the Chief of the Forest Service in May 1934, under authority of the Secretary of Agriculture.

Purpose

The broad purpose of this area, as of the other experimental tracts, is to conduct studies that may promote better forest management and utilization on both public and private lands. More specifically it is the purpose here to learn and demonstrate the basic silvical and ecological facts about the "fog belt" forests and thereby develop the best methods

of protecting, harvesting, reproducing, and managing them for maximum permanent productivity. Attention is being directed particularly to methods of cutting spruce-hemlock stands for maximum volume and value production of pulpwood, sawlogs, and veneer logs, to methods of handling alder stands either to convert to conifers or to maintain as alder, to stand improvement tests, to methods of reforestation cutovers and old burns, and to tests of exotics.

While serving as a study area and proving ground it also furnishes demonstrations for the benefit of the profession and the industry of promising techniques and principles of forest management.

It is planned to leave a strip along the ocean in its virgin condition for scenic, scientific, and recreational purposes. A portion of this area--about 700 acres--has been formally designated as the "Neskowin Crest Natural Area." Consisting largely of old-growth spruce and hemlock and containing representative second growth as well, it is to be kept forever in its undisturbed condition for scientific study and to serve as a forest museum piece representative of the natural coastal forest. The immediate frontage on the Coast Highway will also be left in its natural condition as a scenic roadside strip.

Location - Area - Topography -
Climate - Soil

This research tract lies just north of Salmon River between the summer resort colony of Neskowin and the hamlet of Otis, which is 85 miles by the "Salmon River Cut-off" from Portland and 18 miles from railhead at Grand Ronde. (See map on back cover.) The Oregon Coast Highway traverses it for about 8 miles, entering the south boundary $1\frac{1}{2}$ miles north of Otis and leaving it about 2 miles southeast of Neskowin. The headquarters is 2 miles north of Otis along the highway. Post office address is Otis, Oregon, and telephone connection is through Delake, Oregon.

Most of the area lies on a ridge between Neskowin and Deer Creeks and extends from the precipitous ocean front at Cascade Head, inland for 6 miles. Its topography is characteristic of the Coast Range and is irregular, often abrupt, and dissected by many small canyons. Some flat and gently rolling land occurs along the creeks and at the foot of the slopes. Elevations range from sea level to 1,750 feet.

The climate has equable temperatures, much cloudiness, and frequent rains except in summer, and fogs even then. The normal annual precipitation at the headquarters, almost all in the form of rain, is approximately 90 inches. Along the beach it is known to be considerably less and on the high ridge it is probably more. The mean annual temperature at headquarters is approximately 50° F. Days when the temperature is below freezing or above 80° F. are infrequent. The seasonal and diurnal fluctuations of temperature are slight.

The prevailing soils are deep, residual clay loams, well watered and moderately well drained. Rock outcrops and stony soils are unusual. Most of the soil in the forest is covered with a rather thin layer of rapidly disintegrating humus and duff.

The net acreage of national forest land within this experimental forest is 9,743 acres. Within the exterior boundaries there is about 2,145 acres of privately owned land. Most of the frontage on the Oregon Coast Highway along Neskowin Creek is in private ownership.

Forest Species and Volumes

Over 60 percent of this area is covered by a thrifty, quite even-aged stand of spruce and hemlock which started after a severe forest fire, thought to have been about 1850. This 95- to 100-year-old stand is dense and continuous for miles and varies from almost pure hemlock to nearly pure spruce. Toward the east end of the tract, Douglas-fir is a conspicuous part of the mixture. In places, veteran trees that survived the fire are present, usually with an understory of the 95-year-old timber. Particularly along the immediate ocean frontage old-growth spruce is present, but many are of a limby and wind-swept character. Nowhere is there any very extensive stand of old-growth timber.

There are patches of alder of various age classes chiefly on the settlers' abandoned clearings and on the burns that originated therefrom; alder is also in mixture with the conifers. There are small areas of hillsides repeatedly burned before 1930 and now occupied mostly with alder. There is some grassland and open brushland on the cape.

The 1947 net volumes in thousands of feet, board measure, of the several commercial lumber species of trees that occur in significant amounts on the 9,743 acres of national forest land are:

	Timber on national forest land <u>M ft. b.m.</u>
Sitka spruce -	178,921
<i>Picea sitchensis</i>	
Western hemlock -	196,163
<i>Tsuga heterophylla</i>	
Douglas-fir -	61,239
<i>Pseudotsuga taxifolia</i>	
Western redcedar -	1,012
<i>Thuja plicata</i>	
Red alder -	13,338
<i>Alnus rubra</i>	
Total	450,673

The management plan prepared in 1948 determined the allowable annual cut to be 5,500,000 board feet for the first rotation for 6,949 acres of available and operable coniferous type.

The following tree species are present in openings in the overwood of spruce, hemlock, and Douglas-fir:

<u>Common name</u>	<u>Scientific name</u>
Bigleaf maple	<i>Acer macrophyllum</i>
Bitter cherry	<i>Prunus emarginata</i>
Cascara buckthorn	<i>Rhamnus purshiana</i>
Pacific dogwood	<i>Cornus nuttalli</i>
Vine maple	<i>Acer circinatum</i>
Willow	<i>Salix</i> spp.

Also found in these openings is a luxuriant stand of undergrowth composed of the many species characteristic of the coast region such as:

<u>Common name</u>	<u>Scientific name</u>
Salmonberry	<i>Rubus spectabilis</i>
Thimbleberry	<i>R. parviflorus</i>
Trailing blackberry or dewberry	<i>R. vitifolius</i>
Red huckleberry	<i>Vaccinium parvifolium</i>
Evergreen huckleberry	<i>V. ovatum</i>
Pacific red elder	<i>Sambucus callicarpa</i>
Redflowering currant	<i>Ribes sanguineum</i>
Rusty menziesia	<i>Menziesia ferruginea</i>
Devilsclub	<i>Oplopanax horridus</i>
Salal	<i>Gaultheria shallon</i>
Oregon grape or Cascades mahonia	<i>Mahonia nervosa</i>
Western swordfern	<i>Polystichum munitum</i>
Western bracken	<i>Pteridium aquilinum</i> <i>pubescens</i>
Deerfern	<i>Blechnum spicant</i>
Ladyfern	<i>Athyrium filixfemina</i>

Conspicuous among the herbaceous flowering plants in the forest opening are:

<u>Common name</u>	<u>Scientific name</u>
Fireweed	<i>Epilobium angustifolium</i>
Australian burnweed (A rapidly spreading Australian native that has moved up the coast from California since 1918)	<i>Erechtites prenanthoides</i>
Common groundsel	<i>Senecio vulgaris</i>
Minerslettuce	<i>Claytonia perfoliata</i>

Under the canopy of the forest are:

<u>Common name</u>	<u>Scientific name</u>
Oregon oxalis	Oxalis oregana
Pacific trillium	Trillium ovatum
Beadruby or false lilyofthevalley	Maianthemum dilatatum
Violet	Viola sp.
Smith's fairybells	Disporum smithi
Trefoil foamflower	Tiarella trifoliata
Betony or hedgenettle	Stachys sp.
Pyrola	Pyrola sp.
Twistedstalk	Streptopus curvipes
Bleedingheart	Dicentra sp.

Swordfern, deerfern, and ladyfern are conspicuous under the crown canopy as well as in the openings; the brush species of the openings occur under the canopy but usually disappear under the greatest crown density. Flowering herbaceous plants likewise disappear under such conditions and the ground cover may be only ferns and mosses (Hypnum sp.).

Development and Improvements

Immediately after this experimental forest was established, a party of cruisers made a topographic map, type map, and timber estimate of the tract.

From 1935 to 1939 crews of emergency relief work employees were engaged in construction work to make the area ready for research and demonstration. At the headquarters a combination residence and office, a woodshed-garage, a 2-car garage and workshop, a gravity water system, septic tank, a rustic bridge, and an approach road were built. One-half mile to the northeast is the work camp, which provides quarters for logging, road

construction, and other work crews. About 17 miles of road and 20 miles of trails have been constructed, and 3 additional miles of road will be built on cuttings now under contract.

Administration

The experimental forest is an integral part of the Siuslaw National Forest, and is administered jointly by the Director of the Forest Experiment Station and the Supervisor of the national forest. The latter protects the area from fire and trespass, superintends the construction of the transportation and communication systems, and issues and administers permits for such uses as may be approved by the Experiment Station. The Director is responsible for the maintenance of headquarters facilities, for specifying the terms under which the resources shall be cut or otherwise used, and for planning, installing, and conducting the research program, including sample plots and timber cutting experiments.

The Research Program

Growth of natural stands is being studied by means of permanent plots, weather factors are being measured, regeneration studies are in progress, experimental plantations have been established, some alder stands have been thinned and pruned, slash burning methods and effects are being studied, and numerous applied forest management cuttings on a commercial scale have been made since the first one in 1943.

Applied forest management cuttings listed as "1-A," "3-C," etc. on pages 17 to 23 are similarly designated on the "Map of Applied Forest Management Cutting Units" at the end of this guidebook. The locations of sample plots

are also shown on the map by letters A, B, C, etc. which correspond to the following descriptive list of the studies. For "A" and "B" the location of each individual permanent sample plot is shown on the map by its number.

(A) Permanent Growth Plots in Spruce-Hemlock and Douglas-fir Types. In 1935 a series of 11 plots to study stand behavior and growth was established in representative portions of the prevailing spruce-hemlock stands, then averaging about 84 years old. These 1-acre plots vary from nearly pure hemlock to pure spruce. In the Douglas-fir type, plot 14 was established in 1935 and plots 41 and 42 in 1940. Some plots are placed in the best stands, others where the density is about average for the tract. The volumes are astonishing and testify to the high productivity of this forest.

Some of the data for these plots at the time of the 1945-46 remeasurements are given in the following table:

Volume statistics for growth plots - Scribner scale - 1945-46 remeasurement

(Data on horizontal acre basis - conifers only)

Plot No.	Age	Year	No. trees	Av. d.b.h.	Gross scale trees over 12"	Periodic annual growth		
						From	To	Gross scale trees over 12"
								Bd.ft.
				In.	Bd.ft.			
1	94	1945	249	18.3	142,297	1935	1945	1,912
3	94	"	149	23.2	154,691	"	"	1,701
4	94	"	186	21.5	138,559	"	"	1,608
5	94	"	146	25.3	168,291	"	"	1,894
6	94	"	188	20.4	137,654	"	"	1,837
7	94	"	240	18.7	143,631	"	"	2,136
8	94	"	320	15.9	130,331	"	"	2,112
9	94	"	137	25.7	130,522	"	"	339
10	94	"	147	23.7	116,878	"	"	1,397
12	94	"	184	19.6	123,347	"	"	1,387
13	94	"	205	18.3	117,590	"	"	1,197
14	97	1946	182	19.5	108,904	"	1946	1,366
41	73	"	137	20.0	66,854	1940	"	1,268
42	73	"	136	18.9	62,030	"	"	389

(B) Thinning, Stand Improvement, and Growth in the Alder Type. Several age classes of even-aged alder stands are present on this area. Plots have been established in three premerchantable stands: (1) To test methods of thinning alder to improve volume and quality growth where alder is to be the final crop, (2) to test methods of pruning, and (3) to study the competition between alder and understory conifers and methods of converting to a pure type of one or the other. The following plots are already under observation for one or another of these purposes. The age shown is the approximate present age.

Plot 11 - 22-year-old alder (fall 1949) in competition with smaller conifers, natural stand.

Plot 15 - 22-year-old alder in competition with smaller conifers, natural stand.

Plot 16 - 47-year-old alder suppressing conifers, natural stand.

Plot 17 - 22-year-old alder in competition with conifers. Alder removed in spring 1936 at age 8 years, and conifers thinned to 6' x 6'. Compare with plots 11 and 15.

Plot 18 - 34-year-old alder thinned to 12' x 12' and pruned, large conifers girdled.

Plot 19 - 31-year-old alder--check for plot 18, conifers girdled.

Plot 20 - 31-year-old alder. All trees pruned. Conifers girdled or removed.

Plot 21 - 31-year-old alder--check for plot 20.
Conifers removed.

Plot 22 - 22-year-old alder over conifers.
Alder thinned to 8' x 8'. Conifers
and other competition removed.

Plot 23 - 23-year-old alder over scattered
conifers. Check for plot 22.

These plots were established from 1935 to
1937. Results to date indicate the following:

- (1) When even-aged alders and conifers become established together, alder quickly dominates in height growth and submerges the slower growing conifers. The struggle through the alders is a slow and bitter one for the conifers and is accomplished usually with mortality and reduction in rate of growth. Once alder forms a closed canopy no additional coniferous reproduction becomes established. These facts discount, for this locality at least, the old theory of alder being a nurse tree for conifers.
- (2) The tendency alder has toward epicormic branching makes alder pruning, when associated with thinnings, a practice of doubtful value.
- (3) Comparison of thinned alder plots with their checks revealed no marked difference in growth during the first 10-year period.

- (4) Some soils that are capable of producing a mean annual increment of 200 to 300 cubic feet per acre per year when well stocked with conifers are now well stocked with alder and producing a mean annual increment of one-third this amount, or less.

(C) Tests of Exotics. Plantings of the following exotics have been established:

<u>Common name</u>	<u>Scientific name</u>
Port Orford white-cedar	<i>Chamaecyparis lawsoniana</i>
Redwood	<i>Sequoia sempervirens</i>
Giant sequoia	<i>S. gigantea</i>
Monterey pine	<i>Pinus radiata</i>
Red pine	<i>P. resinosa</i>
Norway spruce	<i>Picea abies</i>
Baldcypress	<i>Taxodium distichum</i>
Black walnut	<i>Juglans nigra</i>
Hybrid poplar	<i>Populus</i>

The Norway spruce, baldcypress, black walnut, and hybrid poplar plantings have been unsuccessful. The Port Orford white-cedar, redwood, big tree, and Norway pine have been reasonably successful from a survival standpoint. One planting of Port Orford white-cedar equals the growth of native spruce and hemlock; others fall below. Apparently this species is very exacting in its soil and moisture requirements for there are considerable variations in growth in short distances. The growth of redwood compares favorably with native spruce and hemlock but the plantings of this species do not test a wide range of site conditions. The big tree plantation has made very little height growth. Norway pine has grown well but its growth is materially below that for native species. The Monterey pine

test was established in the spring of 1947 and its suitability has not yet been determined. Most of the other plantings were made in the early spring of 1937.

(D) Tests of Native Species. Small plantations of cascara buckthorn (Rhamnus purshiana), white fir (Abies concolor) and black cottonwood (Populus trichocarpa) have been unsuccessful. A Douglas-fir plantation made in 1937 is doing well.

(E) Brush Competition Study. Douglas-fir, spruce, and hemlock were planted in 1949 on a brushy site where logging slash was burned and the same species also are being tested on an adjoining brushy site that was not burned following logging. Natural regeneration on unplanted plots in the burned and unburned areas also will be recorded. Information on the treatment necessary to regenerate brushy sites is being sought.

(F) Burned and Unburned Slash Plots. In 1948 two pairs of burned and unburned slash plots were established on sale area 1-C. Fire hazard in succeeding years, and both regeneration and growth of conifers, brush, and herbs following burning and nonburning will be recorded. Soil conditions will be determined from soil samples and erosion will be recorded at staked points. Additional pairs of plots will be established as other areas are clear-cut.

(G) Phenological Observations. Observations of the time of growing, leafing, flowering, and fruiting of forest trees and associated vegetation are taken weekly throughout the growing season. Similar observations are taken at other experimental forests.

(H) Climatic Studies. In cooperation with the U. S. Weather Bureau, temperature and precipitation records are kept yearlong at headquarters. To study the role of fog drip and the distribution of precipitation on various exposures in the forest and in the open, 27 rain gauges were observed, usually at weekly intervals, during 1938-41. Effect of tree crowns on the catch of water in the gauges below was twofold. Light rains often only wet the foliage--the moisture evaporating without falling to the ground, except for the small amount that may have run down the trunks and so reached the ground but not the gauges. In foggy weather the process was reversed, particularly on the cloud-ridden ridge close to the ocean. Here fog was collected and condensed by the tree crowns and dripped to the ground in measurable quantities when there was no moisture caught by the rain gauges in the open. This twofold effect is shown by the record of four stations for 1940-41 in the following table:

	<u>Ann. precipitation</u>	
	<u>In</u>	<u>Under</u>
	<u>open</u>	<u>timber</u>
	<u>In.</u>	<u>In.</u>
Valley, 5 mi. from ocean, elevation 50 ft.	77.6	53.0
Ridge, 5 mi. from ocean, elevation 850 ft.	82.3	73.8
Ridge, 2 mi. from ocean, elevation 750 ft.	78.6	99.1
Ocean front, mouth of Salmon River, eleva- tion 50 ft.	65.9	53.1

Applied Forest Management Cuttings

Objective of the applied forest management cuttings is to evaluate on controlled cuttings of commercial size the economic and silvicultural results of the most promising cutting methods applicable to the types represented on the experimental forest. Conclusions from previous studies in silviculture, forest economics, mensuration, utilization, and fire protection are being tested under various realistic conditions. To date the staggered setting system, the progressive strip clear-cutting system, and several types of intermediate harvest or partial cuttings have been tried.

Among the forest management problems receiving attention in the experimental cutting program is the orderly development of the forest with roads, regeneration of brushy sites, tree measurement scaling methods, minimizing windfall losses and logging damage, and the technique of doing successful partial cutting.

Plots are established on the partially cut tracts to measure growth, mortality, windfall losses, and logging damage. For comparison, check plots are established in uncut timber to determine normal growth and mortality. The progress of regeneration is being studied on the cutting areas. Actual itemized logging costs are obtained from the operators on most cuttings.

The location of applied forest management cuttings made since 1943 may be found on the map at the end of this guidebook. This map also shows the delayed settings for which engineering work has been completed. Timber sales are numbered consecutively and the suffix

letter refers to the logging unit. Thus "1-A" refers to sale number 1, tract A. These units are briefly described below.

The first sale on the experimental forest was made in 1943 on Sloan Creek. A 15-acre patch of high-grade old-growth Douglas-fir was clear-cut as part of the war effort. Concentrations of slash covering about two-thirds of the area were burned and the rest left unburned. It now presents an interesting area for observation; both burned and unburned surfaces are well restocked but sample plots show that stocking on unburned surfaces was more adequate and prompt. There was some seed on the ground in 1943 and some produced each year since. Mortality of newly germinated seedlings of spruce and hemlock, while not precisely recorded, has been estimated at about 99 percent.

Tract 1-A. This 81-acre clear-cut, mainly in a 90- to 100-year-old spruce-hemlock stand, includes the old-growth sale made in 1943. Thus, 15 acres of 1943 old-growth clear-cutting and some 1943 partial cutting, the latter clear-cut in 1948, are within the boundaries of this unit. Stabilization of cutting edges, collection of logging cost information, and observation of regeneration are the research objectives within this setting. Considerable blow-down around the edges of the old sale made it advisable to attempt to stabilize the cutting edges by moving them to sheltered locations.

Stand: Scattered old growth in 95-year-old spruce-hemlock-fir mixture.

Volume: 75,375 board feet cut per acre--total 6,105 M, net Bureau scale, including 1943 sale.

Date of Completion: January 1949

Tract 1-B. This 25-acre partial cutting of pulpwood is being logged with horses. The marking aimed to remove 20 percent of the total volume and was confined to trees likely to die from suppression in the next 10 years, plus trees having considerable defect. Costs of horse logging, damage to the residual stand, growth, and mortality are being studied on this setting.

Stand: 95-year-old spruce-hemlock.

Volume: 12 M per acre cut or 300 M total to be removed in thinings.

Date of Completion: 1949.

Tract 1-C. The objective of this 18.2-acre setting was to begin the study of strip clear-cutting. This is the first of three adjacent settings laid out to be cut in strips 500 by 1,200 feet with the long axis running due north and south. From completion of cutting in February 1948 to April 1949, windfall losses were approximately 180,000 board feet or 10,000 board feet per acre for the setting. All loss was along the north and northeast borders of the strip. Opportunities for salvage are being studied. Logging cost and regeneration information is also being collected.

Stand: 95-year-old spruce-hemlock.

Volume: 87,780 board feet per acre or a total of 1,620 M was removed.

Date of Completion: February 1948.

Tract 1-D. This 9-acre tract is a strip clear-cutting 500 by 800 feet in which the longer axis runs east and west. Two adjacent uncut strips of equal size remain for future cuts. Approximately 15,000 board feet were windthrown along the north edge of this tract during the winter of 1948. Logging cost and windfall information is being collected for this setting.

Stand: 95-year-old spruce-hemlock,
Douglas-fir mixture.

Volume: 70,900 board feet per acre
or a total of 638 M was re-
moved.

Date of Completion: Spring 1948.

Tract 1-E. This is a crop tree thinning. To minimize logging damage, marking of this 100-acre partial cutting was done in two stages, the second to remove trees damaged in the first thinning. Defective and damaged trees made up the bulk of the thinnings, but in addition some thrifty codominants and intermediates were cut or released. To reduce logging damage the sale contract specified that no tractor larger than a D-4 should be used. Experience indicates that advance construction of the main tractor roads previous to felling is a prerequisite to a successful partial cutting job.

Stand: 95-year-old spruce-hemlock,
Douglas-fir mixture.

Volume: 25 percent cut to remove
20,000 board feet per acre.

Date of Completion: 1949.

Tract 2-A. This tract is a 15-acre two-storied stand of scattered old-growth Douglas-fir with a heavy even-aged understory of pole-sized hemlock. The overmature but highly valuable overstory will be removed in a partial cutting to favor the hemlock understory. On half the partially cut area the residual trees likely to decay because of damage in logging will be girdled and poisoned to remove them as competitors in the stand. On the other half no cultural treatment will be given. Records of growth and mortality will be kept on permanent sample plots.

Stand: Scattered old-growth
Douglas-fir with a heavy
even-aged understory of pole-
sized hemlock.

Volume: 750 M. Half this volume is
in windfalls.

Date of Completion: Fall of 1949.

Tract 2-B. A small clear-cut of 6 acres will be made in the same stand as tract 2-A where the volume of old-growth Douglas-fir is concentrated. Natural restocking and wind-fall losses along the cutting edges will be studied in this setting.

Stand: Scattered old-growth
Douglas-fir with a heavy
even-aged understory of pole-
sized hemlock.

Volume: 480 M.

Date of Completion: Fall of 1949

Tracts 3-A and B. On these two clear-cutting areas of 13 and 37 acres, respectively, three types of problems will be studied. General cost records and regeneration records will be kept to help evaluate the staggered setting system. Special treatments designed to regenerate promptly dense brush areas within the settings will be applied and studied.

To aid in developing a precise tree volume measurement method, volumes of standing trees on these tracts have been estimated using the Girard form class volume tables. The results will be compared with both gross and net scale of the logs made by the scaling bureau.

Stand: 95-year-old spruce-hemlock.

Volume: Tract A - 1,100 M.
Tract B - 2,600 M.

Date of Completion: Fall of 1949.

Tract 3-C. Principles uncovered in the two-stage partial cutting of tract 1-E are being applied and further developed on this 82-acre tract. Cost records of the partial cutting are being kept. Records of growth and mortality will be compared with those for the adjoining 40 acres of uncut stand by means of permanent sample plots in each.

Stand: 95-year-old spruce-hemlock, Douglas-fir mixture.

Volume: A total of 1,165 M or 14,200 board feet per acre will be removed in a 25-percent partial cut.

Date of Completion: 1949.

Tract 4-A. This 7.3-acre clear-cut was sold to reduce risk of windfall expected to result from logging adjacent private timber to the south. It provides another unit for the study of the staggered setting system. Regeneration and marginal windfall are the principal factors to be studied here. The area will be logged in 1949.

Stand: 95-year-old spruce-hemlock,
Douglas-fir mixture.

Volume: 550 M.

Date of Completion: 1949.

Sale 5, tracts A through F, has been laid out for the next series of test cuttings.

Tracts 5-A, 5-B, 5-D, 5-F. These four clear-cut settings are 15.5, 22.4, 19.6, and 25.4 acres, respectively. The landings are located on the staggered setting principle to continue study of advantages and disadvantages of this system in the spruce-hemlock type. The study of measures needed to establish seedlings in brushy sites will be continued on these areas. A tree measurement cruise using Girard form class volume tables will be made on area 5-B to continue the study started on tracts 3-A and B. The results will be compared with gross and net scale of the logs obtained from the scaling bureau. Logging costs will be studied in detail.

Stand: 95-year-old spruce-hemlock,
with some scattered old-
growth Douglas-fir.

Volume: Tract A - 970 M; tract B -
1,125 M; tract D - 1,605 M;
tract F - 1,560 M.

Tract 5-C. Partial cutting studies started on tracts 1-E and 3-C will be continued on this 53-acre tract. Growth and mortality will be compared with the unthinned check area to the west by means of permanent plots in each area. Study of partial cutting costs and techniques will be continued.

Stand: 95-year-old spruce-hemlock-fir mixture.

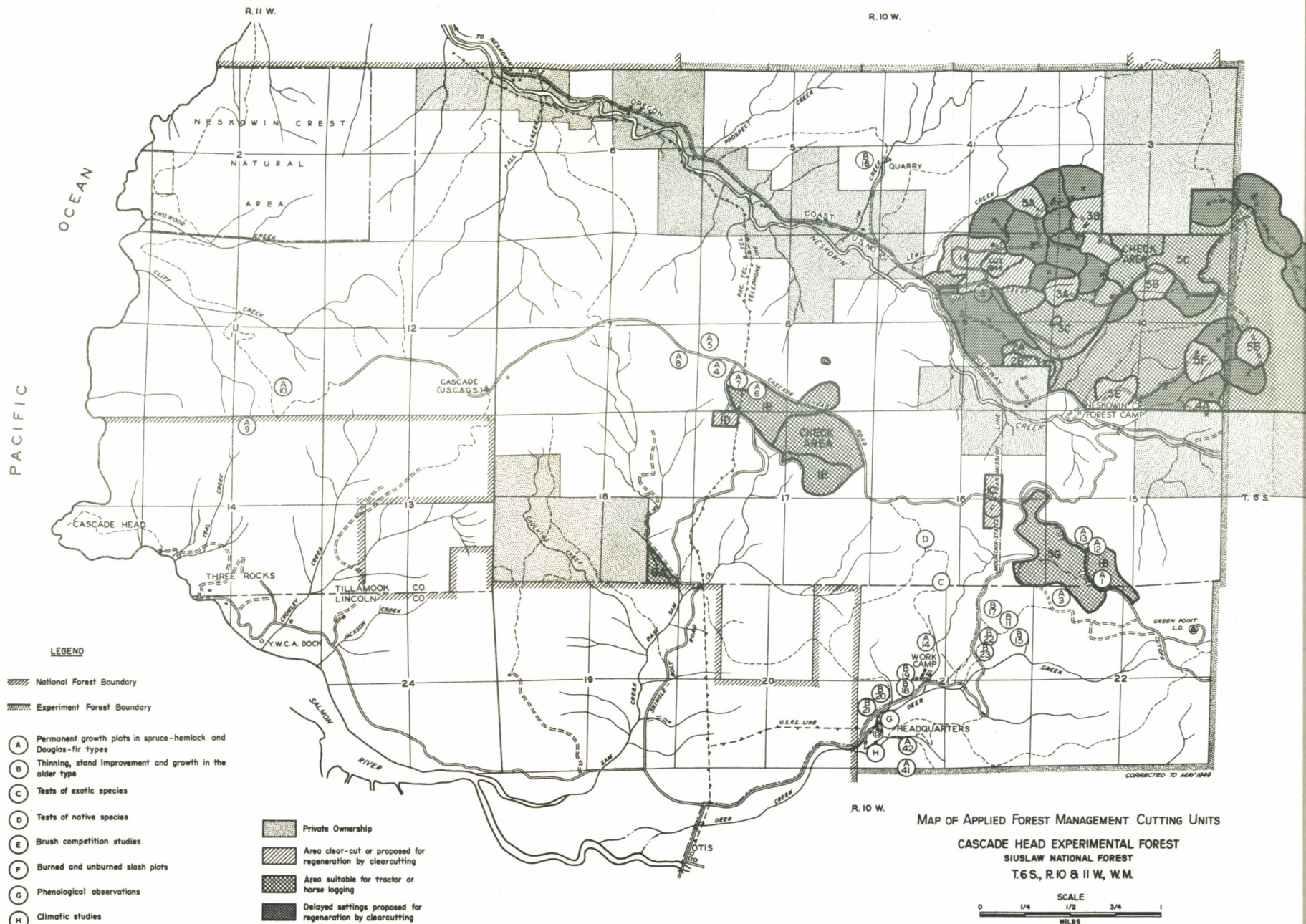
Volume: 20-percent cut will remove 710 M.

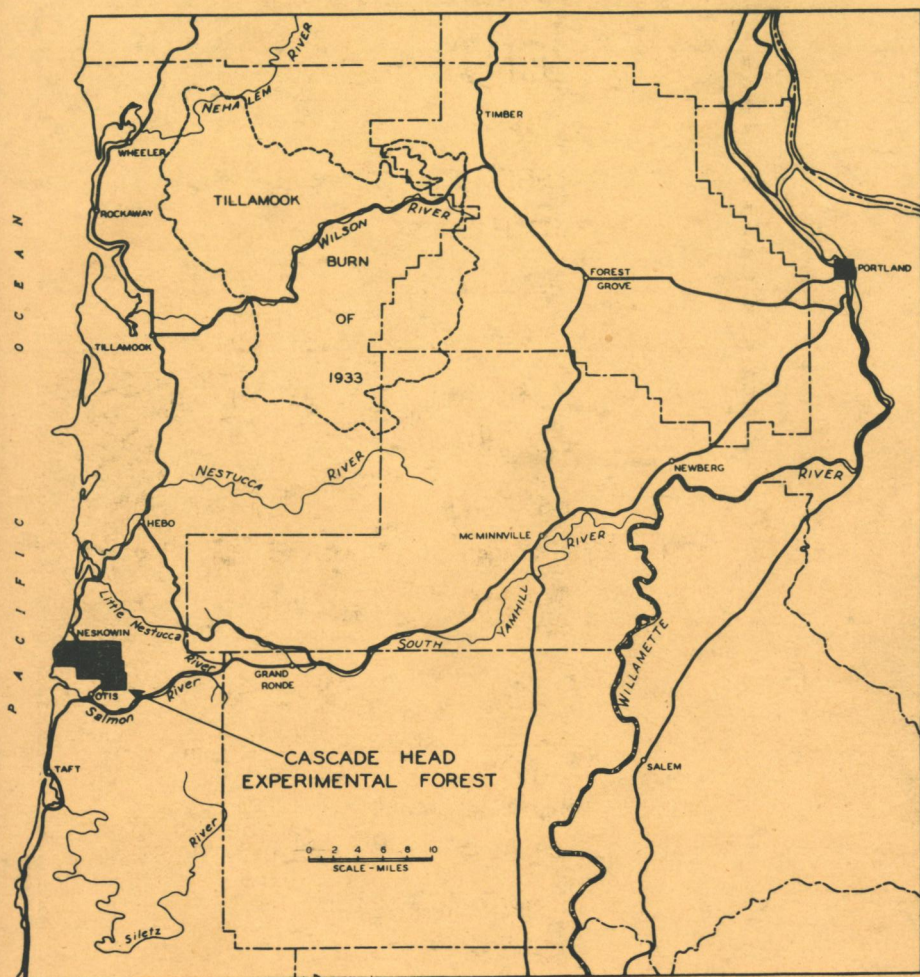
Tract 5-E. This 20.1-acre clear-cut is on favorable topography and will be yarded with tractors. Logging costs will be required for comparison with other methods. Regeneration and marginal windfall will be studied.

Stand: 95-year-old spruce-hemlock.

Volume: 1,515 M.

Tract 6-A. The mature red alder has been sold on this 12-acre area primarily to prevent its being overtopped and killed by conifers. Yarding will be by tractor and horses to minimize damage to the residual coniferous stand. The steps necessary to convert pure alder to coniferous regeneration will be studied in an exploratory manner on several small patches of pure alder included in this sale.





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